WHAT IS CLAIMED IS:

1. An information encoding apparatus for encoding N pieces of information, the information encoding apparatus comprising:

a scrambling pattern generation section for generating M scrambling patterns ($N > M \geq 1$; where M and N are each an integer);

a scrambled information generation section for applying, to each of the N pieces of information, one corresponding scrambling pattern among the M scrambling patterns so as to generate N pieces of scrambled information; and

an encoded information generation section for supplying the N pieces of scrambled information with N parities, respectively, so as to generate encoded information;

wherein each of at least one of the M scrambling patterns is applied to two or more of the N pieces of information.

2. An information encoding apparatus according to claim 1, wherein the M is a divisor of N, and the scrambled information generation section applies one corresponding scrambling pattern among the M scrambling patterns to each of the N pieces of information such that the M scrambling patterns are repeated N/M times, so as to generate the N pieces of scrambled information.

3. An information encoding apparatus according to claim 1, further comprising a first storage section for storing the N pieces of scrambled information and the N parities in order

to supply the N pieces of scrambled information with the N parities.

4. An information encoding apparatus according to claim 1, further comprising a second storage section for storing the M scrambling patterns.

5. An information encoding apparatus according to claim 1, wherein the encoded information generation section is a division circuit.

6. An information encoding apparatus according to claim 1, wherein the encoded information generation section generates the N parities by erasure correction.

7. An information encoding apparatus according to claim 1, wherein N is 32 and M is 1.

8. An information encoding method for encoding N pieces of information, the information encoding method comprising the steps of:

(a) generating M scrambling patterns ($N > M \geq 1$; where M and N are each an integer);

(b) applying, to each of the N pieces of information, one corresponding scrambling pattern among the M scrambling patterns, thereby generating N pieces of scrambled information; and

(c) supplying the N pieces of scrambled information with N parities, respectively, thereby generating encoded information;

wherein each of at least one of the M scrambling patterns is applied to two or more of the N pieces of information.

9. An information encoding method according to claim 8, wherein the M is a divisor of N, and step (b) includes the step of applying one corresponding scrambling pattern among the M scrambling patterns to each of the N pieces of information such that the M scrambling patterns are repeated N/M times, thereby generating the N pieces of scrambled information.

10. An information encoding method according to claim 8, further comprising the step of storing the N pieces of scrambled information and the N parities in order to supply the N pieces of scrambled information with the N parities.

11. An information encoding method according to claim 8, further comprising the step of storing the M scrambling patterns.

12. An information encoding method according to claim 8, wherein step (c) includes the step of generating the N parities by division.

13. An information encoding method according to claim 8, wherein step (c) includes the step of generating the N parities by erasure correction.

14. An information encoding method according to claim 8, wherein N is 32 and M is 1.

15. An information re-encoding apparatus for re-encoding a plurality of pieces of first encoded information into a plurality of pieces of second encoded information, wherein:

the plurality of pieces of first encoded information include a plurality of first scrambled information scrambled

by performing an arithmetic operation on a plurality of first scrambling patterns with respect to a plurality of pieces of information by a first method;

the plurality of pieces of second encoded information include a plurality of pieces of second scrambled information scrambled by performing an arithmetic operation on a plurality of second scrambling patterns with respect to the plurality of pieces of information by the first method, and a plurality of second parities,

the information re-encoding apparatus comprising:

a third scrambling pattern generation section for performing an arithmetic operation on the plurality of first scrambling patterns with respect to the plurality of second scrambling patterns by a second method, so as to generate a plurality of third scrambling patterns;

a scrambled information generation section for performing an arithmetic operation on the plurality of third scrambling patterns with respect to the plurality of pieces of first scrambled information by the first method, so as to generate the plurality of pieces of second scrambled information; and

an encoded information generation section for supplying the plurality of pieces of second scrambled information with the plurality of second parities, so as to generate the plurality of pieces of second encoded information;

wherein the arithmetic operations performed by the first method and the second method fulfill $(A \bigcirc B) \bullet B = A$, where $\bigcirc$ represents a first operator representing the arithmetic operation to be performed by the first method, the $\bullet$ represents a second operator representing the arithmetic operation to be performed by the second method, and A and B each represent an arbitrary value.

16. An information re-encoding apparatus according to claim 15, further comprising a first storage section for storing the plurality of pieces of second scrambled information and the plurality of second parities in order to supply the plurality of pieces of second scrambled information with the plurality of second parities.

17. An information re-encoding apparatus according to claim 15, further comprising a second storage section for storing the plurality of third scrambling patterns and the plurality of third parities.

18. An information re-encoding apparatus according to claim 15, wherein:

the plurality of pieces of first encoded information include a plurality of first parities; and

the encoded information generation section includes:

a third parity generation section for generating a plurality of third parities in correspondence with the plurality of third scrambling patterns; and

a second parity generation section for performing an arithmetic operation on the plurality of third parities with respect to the plurality of first parities by the first method, so as to generate the plurality of second parities.

19. An information re-encoding apparatus according to claim 18, wherein the third parity generation section is a division circuit.

20. An information re-encoding apparatus according to claim 18, wherein the third parity generation section

generates the plurality of third parities by erasure correction.

21. An information re-encoding apparatus according to claim 18, wherein:

the plurality of pieces of first scrambled information are N pieces of information, the plurality of third scrambling patterns are M pieces of information ($N > M \geq 1$; M and N are each an integer; and M is a divisor of N), the plurality of first parities are N pieces of information, and the plurality of third parities are M pieces of information;

the scrambled information generation section performs an arithmetic operation on one corresponding third scrambling pattern among the plurality of third scrambling patterns with respect to each of the plurality of pieces of first scrambled information by the first method, such that the plurality of third scrambling patterns are repeated N/M times, so as to generate N pieces of second scrambled information; and

the second parity generation section performs an arithmetic operation on one corresponding third parity among the plurality of third parities with respect to each of the plurality of first parities by the first method, such that the plurality of third parities are repeated N/M times, so as to generate N pieces of second parities.

22. An information re-encoding apparatus according to claim 21, wherein N is 32 and M is 2.

23. An information re-encoding method for re-encoding a plurality of pieces of first encoded information into a plurality of pieces of second encoded information, wherein:

the plurality of pieces of first encoded information include a plurality of first scrambled information scrambled by performing an arithmetic operation on a plurality of first scrambling patterns with respect to a plurality of pieces of information by a first method;

the plurality of pieces of second encoded information include a plurality of pieces of second scrambled information scrambled by performing an arithmetic operation on a plurality of second scrambling patterns with respect to the plurality of pieces of information by the first method, and a plurality of second parities,

the information re-encoding method comprising the steps of:

(a) performing an arithmetic operation on the plurality of first scrambling patterns with respect to the plurality of second scrambling patterns by a second method, thereby generating a plurality of third scrambling patterns;

(b) performing an arithmetic operation on the plurality of third scrambling patterns with respect to the plurality of pieces of first scrambled information by the first method, thereby generating the plurality of pieces of second scrambled information; and

(c) supplying the plurality of pieces of second scrambled information with the plurality of second parities, thereby generating the plurality of pieces of second encoded information;

wherein the arithmetic operations performed by the first method and the second method fulfill $(A \bigcirc B) \bullet B = A$, where $\bigcirc$ represents a first operator representing the arithmetic operation to be performed by the first method, the $\bullet$ represents a second operator representing the arithmetic operation to be performed by the second method, and A and B each represent an arbitrary value.

24. An information re-encoding method according to claim 23, further comprising the step of storing the plurality of pieces of second scrambled information and the plurality of second parities in order to supply the plurality of pieces of second scrambled information with the plurality of second parities.

25. An information re-encoding method according to claim 23, further comprising the step of storing the plurality of third scrambling patterns and the plurality of third parities.

26. An information re-encoding method according to claim 23, wherein:

the plurality of pieces of first encoded information include a plurality of first parities; and

step (c) includes the steps of:

(c-1) generating a plurality of third parities in correspondence with the plurality of third scrambling patterns; and

(c-2) performing an arithmetic operation on the plurality of third parities with respect to the plurality of first parities by the first method, thereby generating the plurality of second parities.

27. An information re-encoding method according to claim 26, wherein step (c-1) includes the step of generating the plurality of third parities by division.

28. An information re-encoding method according to claim 26, wherein step (c-1) includes the step of generating the plurality of third parities by erasure correction.

29. An information re-encoding method according to claim 26,

wherein:

the plurality of pieces of first scrambled information are N pieces of information, the plurality of third scrambling patterns are M pieces of information ($N > M \geq 1$; M and N are each an integer; and M is a divisor of N), the plurality of first parities are N pieces of information, and the plurality of third parities are M pieces of information;

step (b) includes the step of performing an arithmetic operation on one corresponding third scrambling pattern among the plurality of third scrambling patterns with respect to each of the plurality of pieces of first scrambled information by the first method, such that the plurality of third scrambling patterns are repeated N/M times, thereby generating N pieces of second scrambled information; and

step (c-2) includes the step of performing an arithmetic operation on one corresponding third parity among the plurality of third parities with respect to each of the plurality of first parities by the first method, such that the plurality of third parities are repeated N/M times, thereby generating N pieces of second parities.

30. An information re-encoding method according to claim 29, wherein N is 32 and M is 2.